E-CHALLENGES & CLINICAL DECISIONS

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Pulmonary Dysfunction After Lung Transplantation: The Dilemma of Coexisting Mitral Regurgitation

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PROGRESSION of mitral regurgitation (MR) after lung transplantation previously has been found in patients who were unable to be weaned from mechanical ventilation postoperatively.^{1,2} In these patients, surgical repair of the mitral valve (MV) led to successful respiratory recovery. The authors report an unusual case of a patient who underwent left single orthotopic lung transplant (SOLT) and postoperative pulmonary compromise. The possible contribution of coexisting MR was a confounding clinical factor that was addressed successfully upon presentation for subsequent right SOLT.

CASE REPORT

A 63-year-old male with end-stage idiopathic pulmonary fibrosis (IPF) presented for a left SOLT. His past medical history consisted of MV prolapse, hypertension, type-II diabetes, and coronary artery disease. A transthoracic echocardiogram (TTE) 3 months before transplantation showed normal right and left ventricular function, mild left ventricular hypertrophy (LVH), and mild-to-moderate eccentric MR (Fig 1, Video clip 1).

During intraoperative monitoring, the baseline pulmonary artery (PA) pressure was 40/24 mmHg. The intraoperative transesophageal echocardiogram (TEE) showed a flail A1 segment (Figs 2 and 3; Video clips 2 and 3) and an eccentric, posteriorly directed jet of moderate MR (Fig 4, Video clip 4). Such findings were communicated to the surgical team.

CHALLENGES

(1) Should MR be surgically addressed? (2) Was the MR symptomatic before transplantation?

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CLINICAL COURSE

Because the preoperative workup had shown mild MR, which was not thought to contribute to the patient's symptoms, and given the commitment to a left SOLT approach, the surgical team decided that the MR would not be addressed surgically.

The intraoperative course was uncomplicated. Post-procedural intraoperative TEE examination showed no significant changes. In the cardiothoracic surgery intensive care unit, the patient was extubated on the first postoperative day and discharged from the hospital on the tenth postoperative day.

One month after surgery, the patient presented in acute respiratory distress. He underwent pulmonary function testing, which showed a reduction in pulmonary function and presence of a restrictive process. Chest radiograph showed a left pleural effusion. Upon hospital admission, a thoracostomy tube was inserted with minimal drainage, a transbronchial biopsy was negative for rejection, and respiratory cultures were negative. After further forced diuresis, the patient was discharged on supplemental oxygen.

The presence of persistent hypoxemic respiratory failure, with no evidence of allograft rejection or infection with compromised functional status, and concerns for mediastinal shift attributable to right lung IPF, prompted placement on the transplant list for right SOLT.

Eight weeks after his initial transplantation, the patient underwent a right SOLT. Intraoperative baseline PA pressure was 25/18 mmHg. The TEE showed severe eccentric MR with a posteriorly directed jet, flail A1 segment (Fig 5, Video clip 5), and a 7-mm vena contracta (Fig 6).

CHALLENGES

(1) Should MR be addressed surgically this time? (2) Were the preoperative symptoms attributable to MR?

CLINICAL COURSE

In light of the severity and progression of the MR, and given the feasibility of surgical approach, it was decided that the MV would be repaired. After dissection of the right native lung, the patient was placed on cardiopulmonary bypass (CPB). Artificial chords were placed for supporting the A1 leaflet, and an MV annuloplasty performed with a 26-mm semi-rigid ring. After MV repair, the right SOLT was completed and CPB was

Fig 1. Transthoracic parasternal long axis view showing an eccentric jet of mitral regurgitation (arrow) on transmitral color-flow Doppler.

Fig 4. Midesophageal long-axis view of the mitral valve showing an eccentric jet of mitral regurgitation.

Fig 2. Midesophageal five-chamber view, showing a flail anterior mitral leaflet (arrow) before left single orthotopic lung transplant.

Fig 5. Still frame image of a three-dimensional echocardiographic en face view of the mitral valve with a flail A1 scallop (arrow) before right single orthotopic lung transplant.

Fig 3. Still frame image of a three-dimensional echocardiographic en face view of the mitral valve with a flail A1 scallop (arrow) before left single orthotopic lung transplant.

Fig 6. Vena contracta measurement of the mitral regurgitant jet.

Fig 7. Midesophageal five-chamber view after completion of the mitral valve repair and right orthotopic lung transplant showing satisfactory seating of a mitral annular ring.

discontinued uneventfully. The post-procedure intraoperative TEE showed a well-seated MV ring with no residual MR (Fig 7, Video clip 6). The patient subsequently was extubated on the first postoperative day and discharged from the hospital on the fourth postoperative day with no supplemental oxygen. The patient did not have recurrence of pulmonary symptoms at the last follow-up, 2 years later.

DISCUSSION

This case illustrates the overlap of symptomatology from primary lung disease and valvulopathies and the importance of following-up intraoperative TEE findings. The patient's acutely decompensated hypoxic respiratory failure was thought to be from a pulmonary etiology. Despite numerous tests, an echocardiogram was never sought to evaluate the contribution of MR to the symptomatology.

Current guidelines recommend that MV surgery should be performed on symptomatic patients with severe MR.³ Patients who develop a flail leaflet from rupture of chordae

Fig 8. Internal diameter of the right ventricle measured at end-diastole in the mid-esophageal four-chamber view (A and B), and at the mid-point of the right ventricle in the midesophageal inflow outflow view (C and D). The dimensions of the right ventricle were larger before left single-lung transplant (A and C) and had decreased on presentation for the right single-lung transplant (B and D).

tendineae or who have significant elongation also may be managed surgically. The present patient's MV prolapse was known on presentation for the initial SOLT; however, it was thought to be asymptomatic; therefore, when the flail segment was found on intraoperative TEE, it was not addressed surgically. Eventually, the MR progressed and was not reevaluated when the patient developed postoperative respiratory failure.

Other cases of progression of MR after lung transplantation contributing to unsuccessful mechanical ventilation weaning have been described. Hamad et al described a patient with moderate MR who underwent bilateral orthotopic lung transplant (BOLT) and was unable to be weaned from the ventilator postoperatively.¹ The patient suffered acute episodes of pulmonary edema and all pulmonary etiologies had been ruled out. Five weeks postoperatively, the patient had an MV replacement and was extubated on the third postoperative day. In a case with a similar course, Bermudez et al described a patient with IPF who underwent BOLT.² Attempts to wean ventilatory support were unsuccessful. Six weeks postoperatively, a TTE showed previously unrecognized severe MR. The authors speculated that decrease in PA pressure post-transplant with resultant right ventricle (RV) decompression led to inverse changes in left ventricular dimensions. The subsequent MV annular geometry alteration resulted in MR.

In support of the theory proposed by Bermudez et al, the present patient had moderate pulmonary hypertension with RV internal diameter in diastole of 3.7 cm before initial transplantation. Two months later, PA pressures were normal and RV internal diameter in diastole had decreased to 2.8 cm (Fig 8).

Progression of MR requiring surgical intervention in the setting of lung transplantation is rare.^{1,2} Therefore, it is difficult to make recommendations when MR is recognized on intraoperative TEE at the time of transplantation due to several factors that must be considered in the decision-making process. These include preoperative severity of MR, symptomatology attributable to MR, and limitations of the planned surgical approach. This case illustrates the overlapping symptomatology of severe MR with end-stage lung disease. In this setting, the significance of pulmonary compromise often can overshadow the search for other causes of respiratory failure.

SUMMARY

A case of MR progression after single-lung transplant as a significant contributor to postoperative respiratory failure is reported. Pre-existing MR may progress due to the decompressive effects of lung transplantation on RV dimension and consequent alteration of MV geometry. This case highlights the importance of intraoperative TEE findings, especially pertaining to valvulopathies in the setting of lung transplantation. Postoperative surveillance of significant findings is imperative when any new symptoms are being investigated.

APPENDIX A. SUPPORTING INFORMATION

Supplementary material cited in this article is available online at [doi:10.1053/j.jvca.2014.06.017](https://doi.org/10.1053/j.jvca.2014.06.017).

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